



CERES FLASHFlux Status:

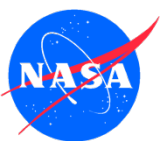
Near-Real Time Surface Radiative Fluxes and Meteorology for Research and Applications

***Paul Stackhouse, David P. Kratz, and Takmeng
Wong, (NASA LaRC)***

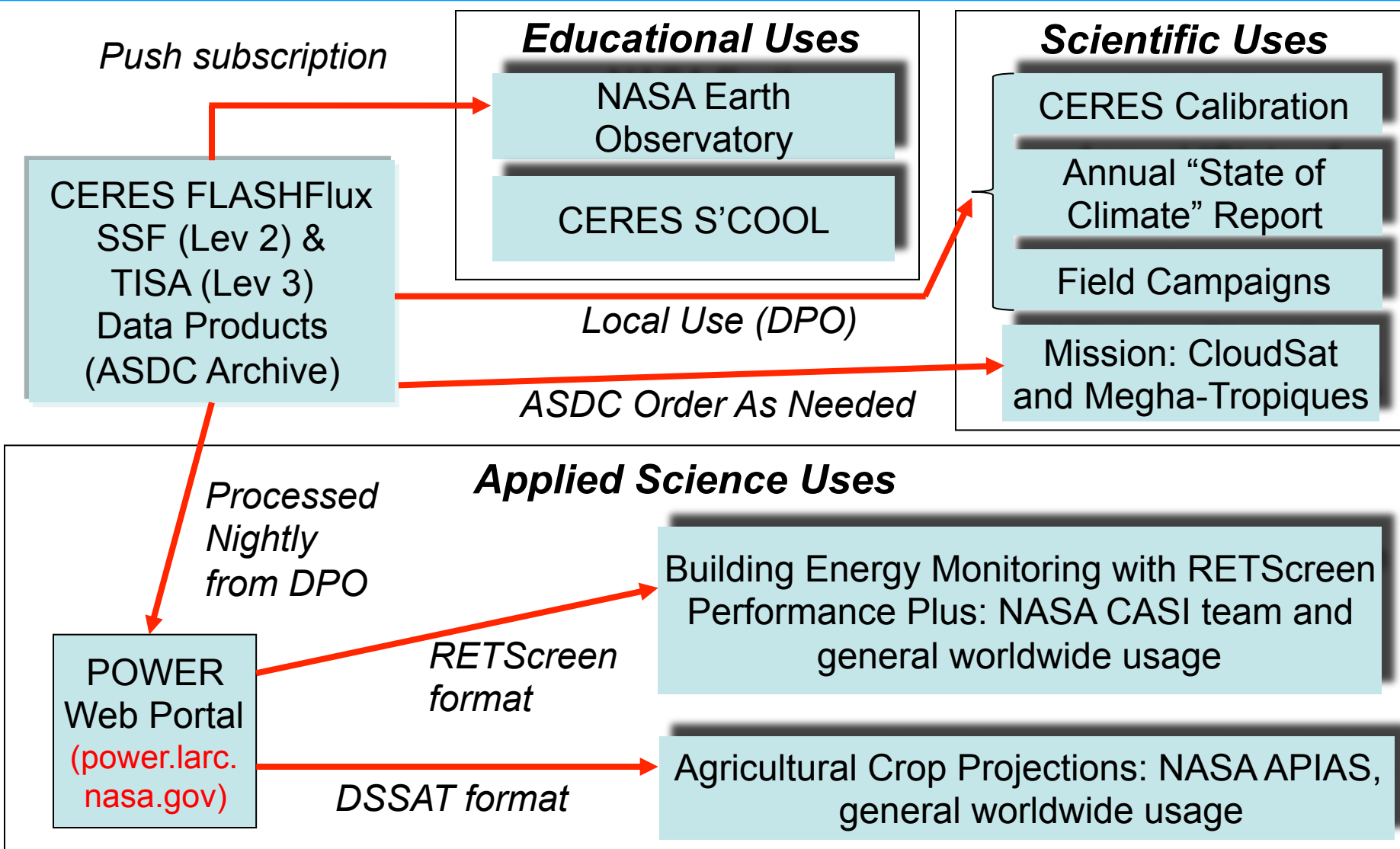
***PC Sawaengphokhai, Shashi Gupta and Anne
Wilber (SSAI)***

Jason Barnett, Booz-Allen-Hamilton

***Tonya Davenport, Lindsay Parker and the
Atmospheric Science Data Center Team (SSAI)***



FLASHFLUX: Schematic of Current Uses





FLASHFlux Status

- ***Continuing production with v3B (since August 2014)***
 - FLASHFlux SSF available via CERES subsetter and ASDC through 8/28
 - FLASHFlux TISA available from ASDC and specialized formats through POWER web portal (power.larc.nasa.gov) through 8/26
 - First TISA netCDF files created
- ***Version 3B Validation***
 - Processed and compared to latest validation from BSRN, ARM & buoy
- ***Flux Anomalies from the Evolving 2015 El Nino***
 - “State of Climate 2014 Published”
 - Differences between July 2015 and July 2013
- ***Applied Science Usage: Expansion to GIS***
 - Agricultural and Energy usage showed continued growth since May (1100+ users, 400,000+ orders per, 21+ GB per month)
 - First efforts to serve CERES using GIS tools for FLASHFlux and SYN1Deg

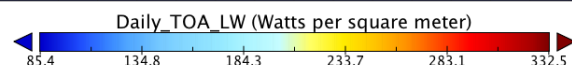
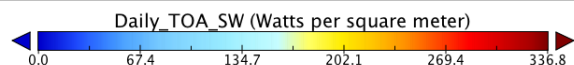
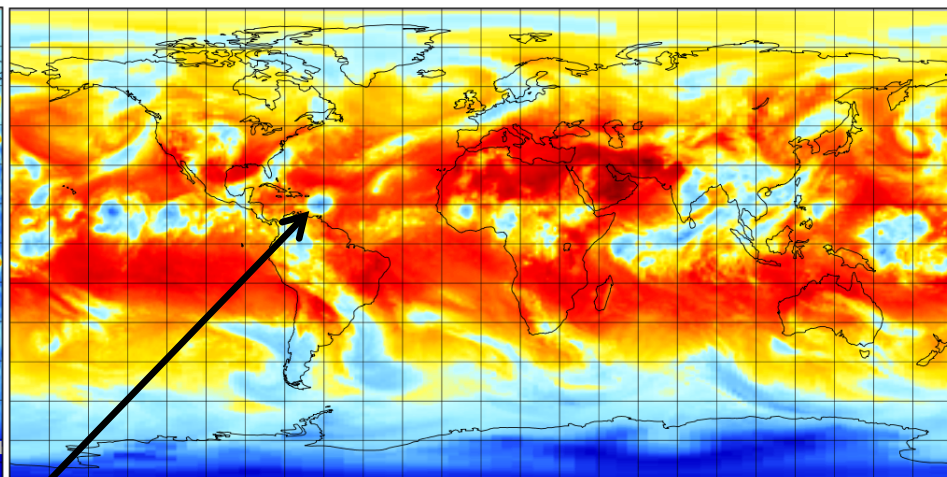
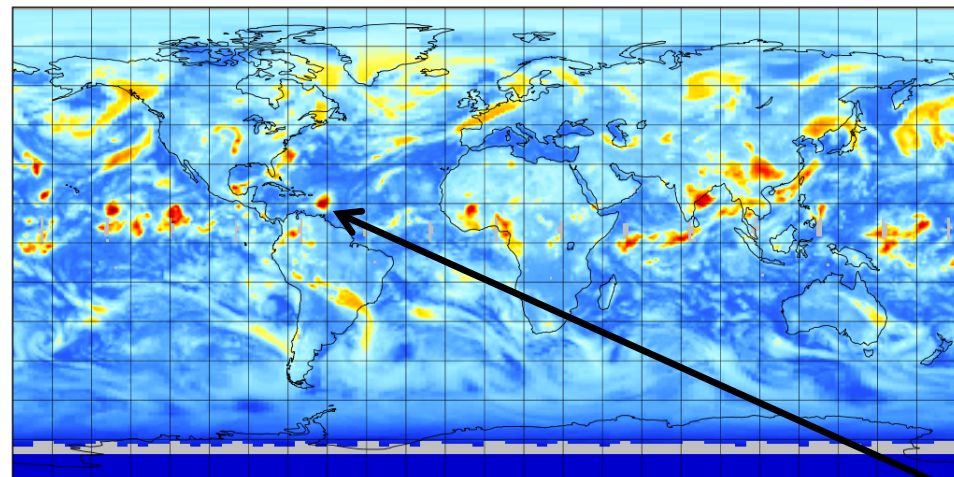


FLASHFlux .netCDF Format

(from Panoply – 8/27/15)

Daily_TOA_SW

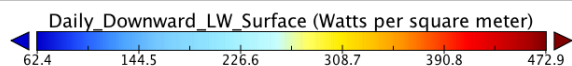
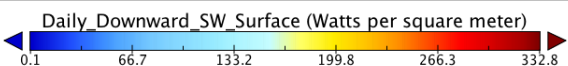
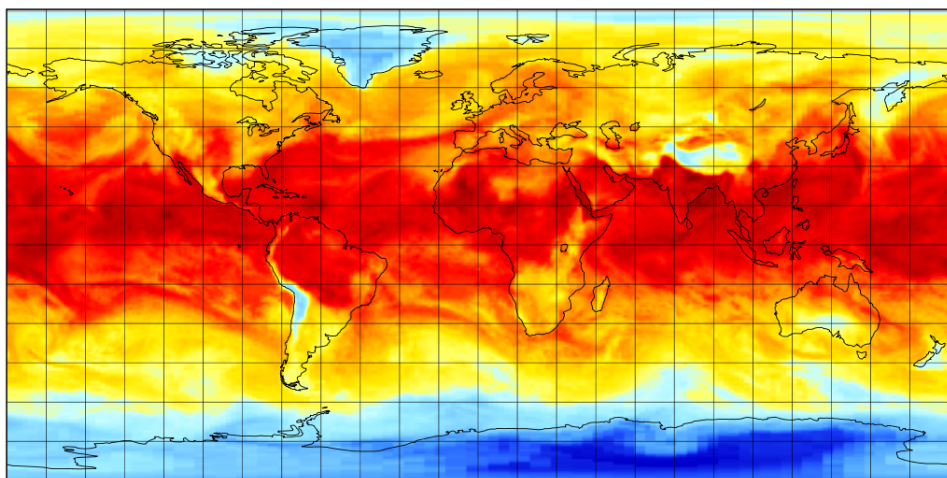
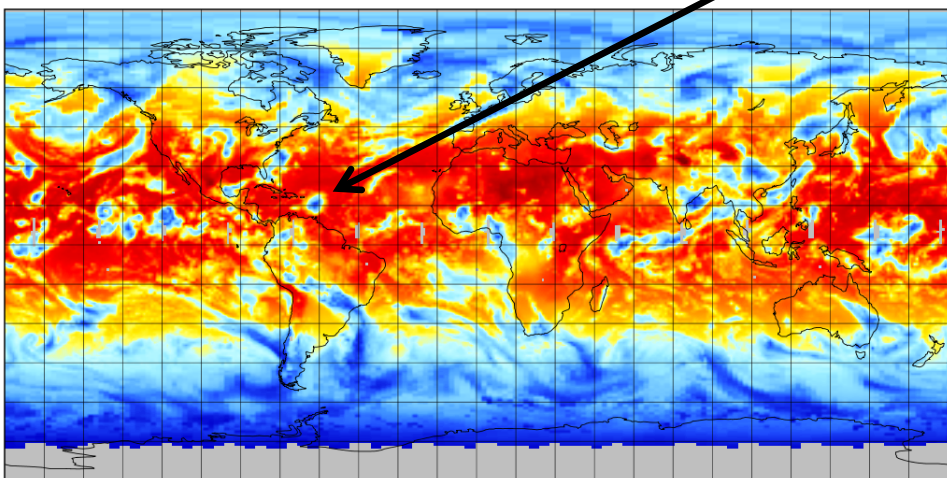
Daily_TOA_LW

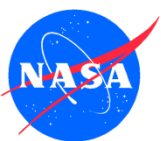


TS Erika

Daily_Downward_SW_Surface

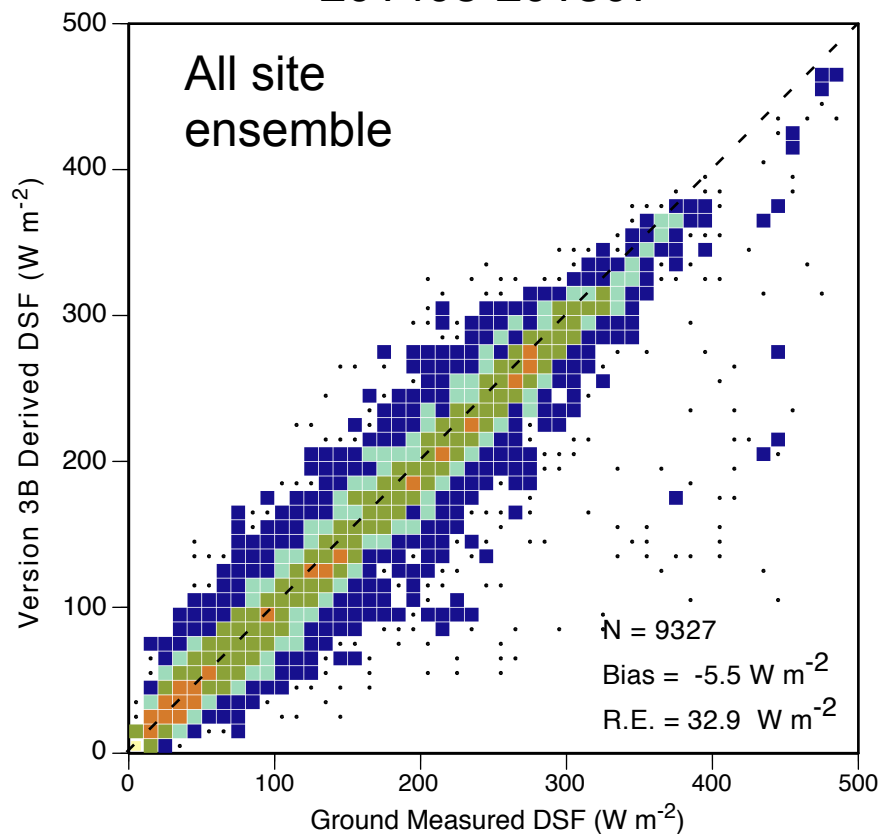
Daily_Downward_LW_Surface





Recent SW Validation: 8/2014 – 7/2015

Version 3B
201408-201507



· 1 ■ 2 - 10 ■ 11 - 20 ■ 21 - 50 ■ 51 - 100 ■ > 100

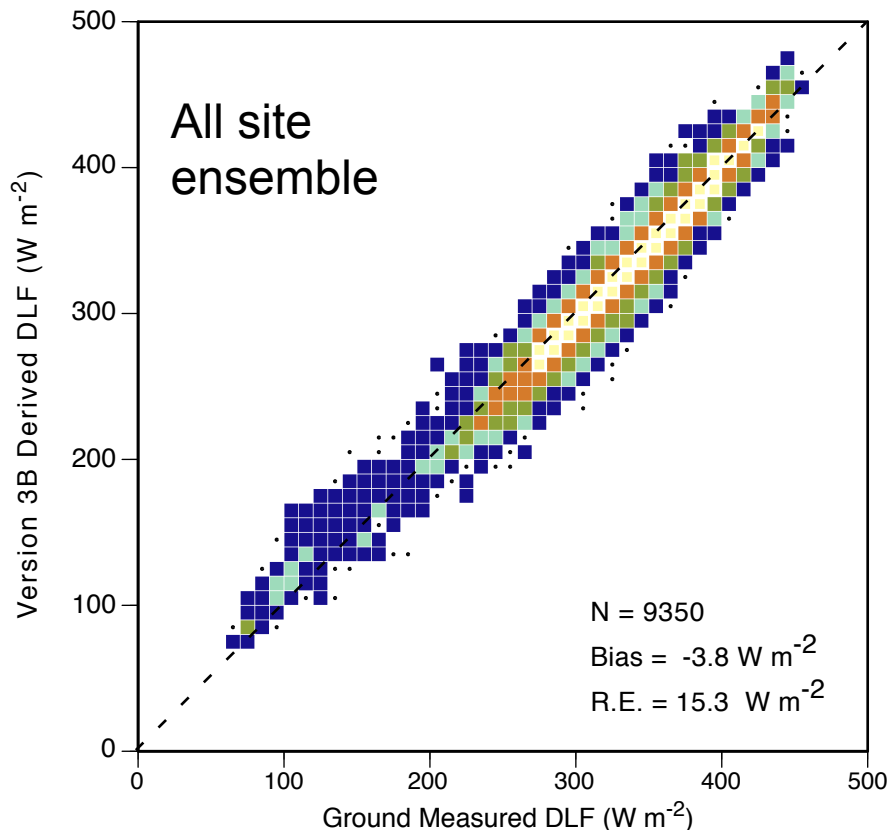
Daily Averaged TISA Comparison

Ensemble Type	Bias (W m^{-2})	RMS (W m^{-2})	N
All Obs	-5.5	34.8	9327
Continental	-4.4	28.6	3989
Coastal	-2.6	22.8	2809
Desert	-4.3	20.5	1091
High Latitude	-57.8	104.3	229
Island	3.6	27.7	479
Buoy	10.2	35.6	559



Recent LW Validation: 8/2014 –7/2015

Version 3B
201408-201507



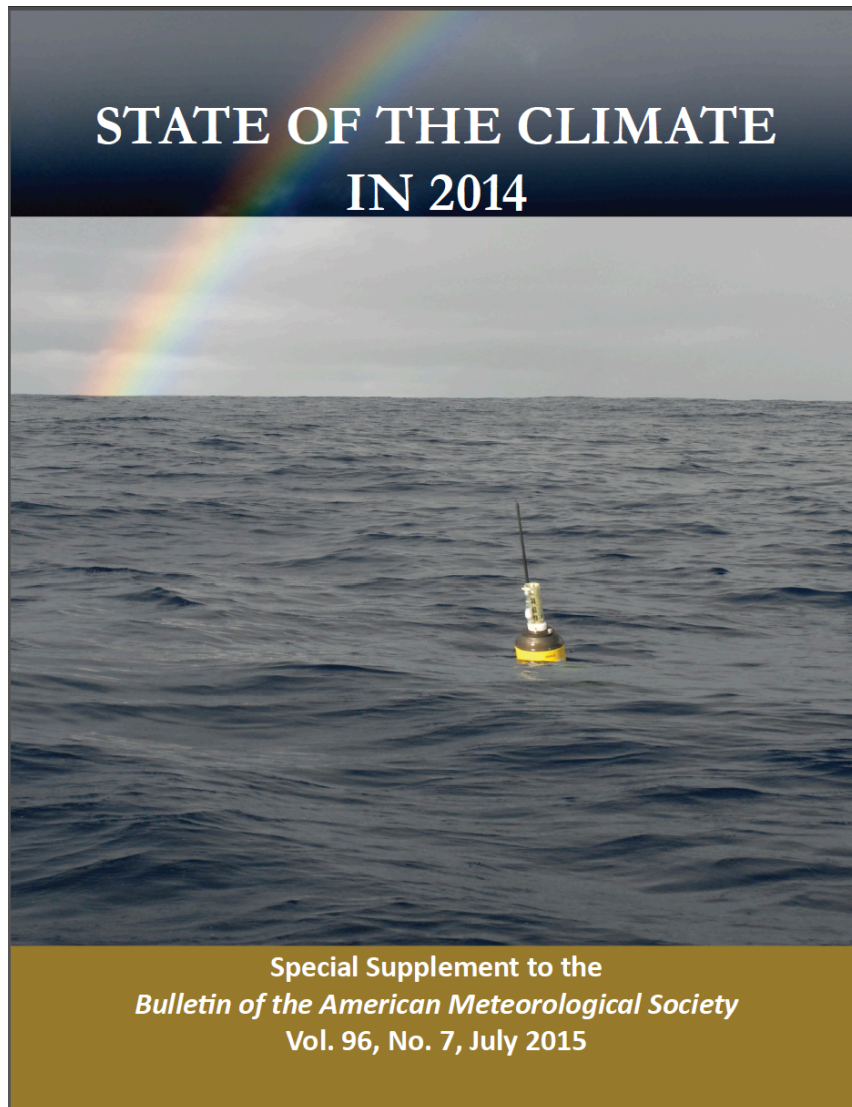
• 1 ■ 2 - 10 ■ 11 - 20 ■ 21 - 50 ■ 51 - 100 ■ > 100

Daily Averaged TISA Comparison

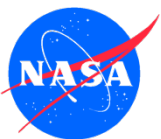
Ensemble Type	Bias (W m^{-2})	RMS (W m^{-2})	N
All Obs	-3.8	15.8	9350
Continental	-7.8	18.2	3814
Coastal	-1.6	12.7	2819
Desert	-4.4	14.4	1080
High Latitude	11.5	21.4	444
Island	-0.2	9.1	451
Buoy	4.0	14.0	560



State of the Climate 2014 Published



- *CERES FLASHFlux contributed to the special annual BAMS report on the “State of the Climate in 2014”.*
- *Issue appeared in Aug. 2015, providing estimates of changes in year to year Global Earth Radiation Budget for the first time.*
- *These data were extended and normalized relative to the CERES EBAF 2.8 products for this report.*



State of Climate 2014 Results

Wong et al., 2015: Earth Radiation Budget [in "State of the Climate in 2014"]. *BAMS*, 96 (7), S37-S38.

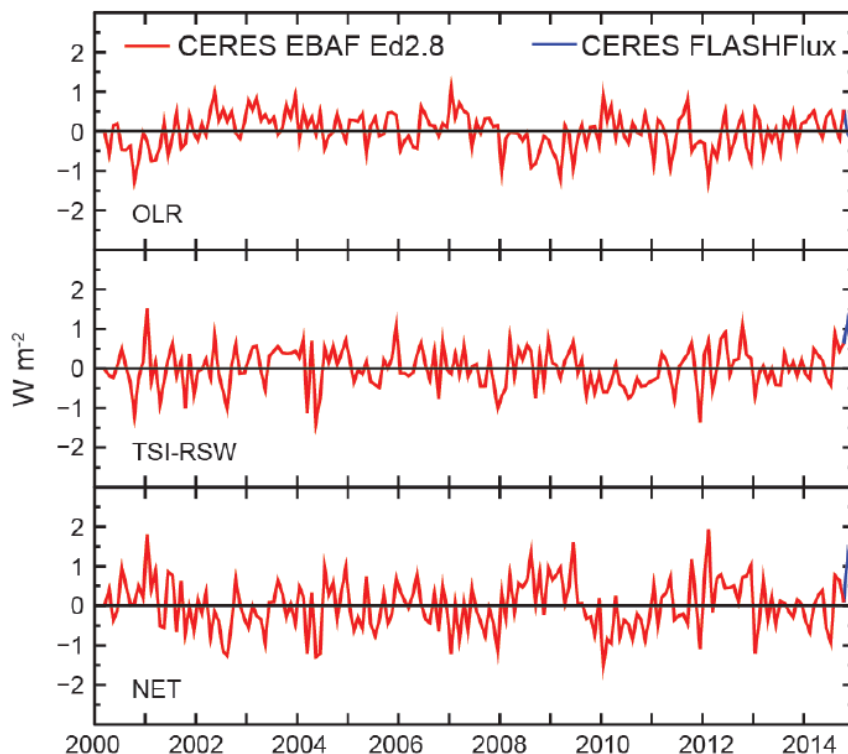
Year-to-year global changes 2014 vs. 2013

TABLE 2.6. Global-annual mean TOA radiative flux changes between 2013 and 2014, the 2014 global-annual mean radiative flux anomalies relative to their corresponding 2001–13 mean climatological values, and the 2- σ interannual variabilities of the 2001–13 global-annual mean fluxes (all units in W m^{-2}) for the outgoing longwave radiation (OLR), total solar irradiance (TSI), reflected shortwave (RSW) and total net fluxes. All flux values have been rounded to the nearest 0.05 W m^{-2} .

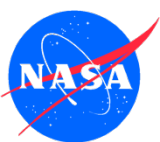
	One year change (2014 minus 2013) (W m^{-2})	2014 anomaly (relative to climatology) (W m^{-2})	Interannual variability (2001–13) (W m^{-2})
OLR	+0.15	+0.15	± 0.50
TSI	-0.05	+0.05	± 0.20
RSW	-0.45	-0.25	± 0.40
Net	+0.25	+0.15	± 0.65

FIG. 2.34. Time series of global-monthly mean de-seasonalized anomalies (W m^{-2}) of TOA Earth radiation budget for (top) OLR, (middle) absorbed shortwave (TSI-RSW), and (lower) total net (TSI-RSW-OLR) from Mar 2000 to Dec 2014. Anomalies are relative to the calendar month climatology derived

Global-monthly average flux anomalies

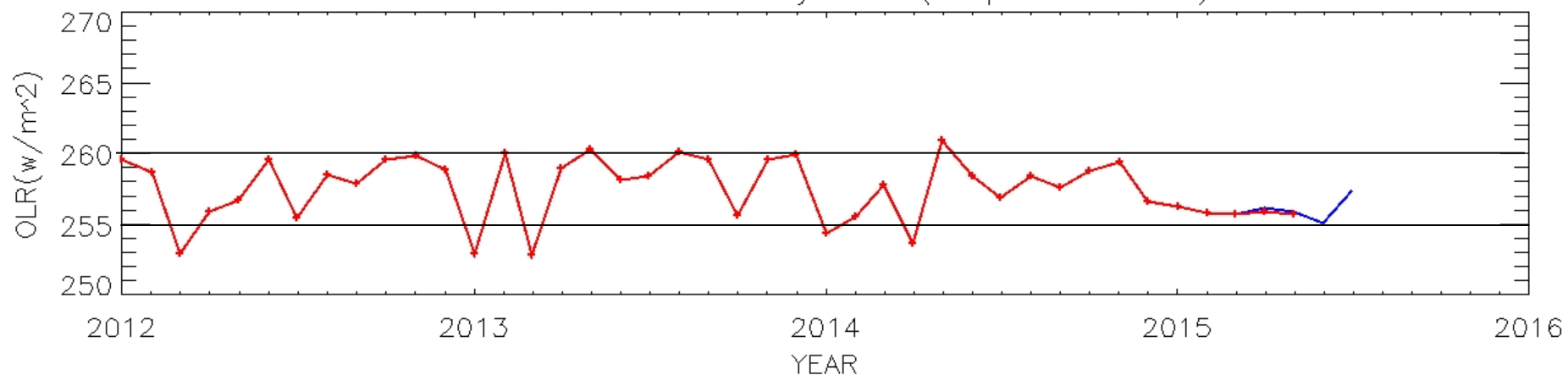


for 2001–13. The time series shows the CERES EBAF Ed2.8 IDeg data (Mar 2000–Oct 2014) in red and the CERES FLASHFlux version 3B data (Nov–Dec 2014) in blue; see text for merging procedure. (Source: CERES EBAF Ed2.8 IDeg and the FLASHFlux version 3B.)

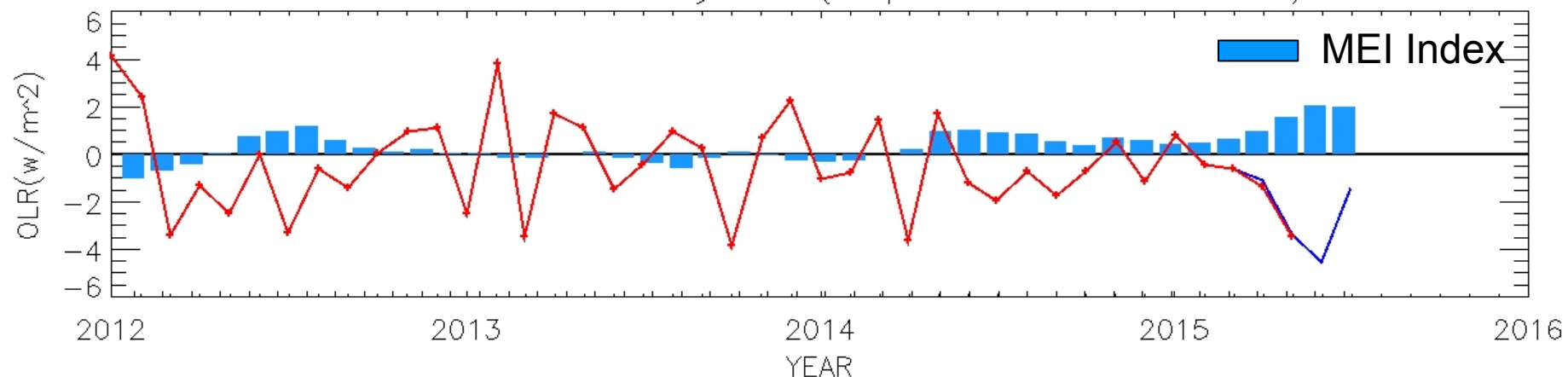


2015 Tropical Pacific Anomalies to Date (20N-20S, 120E-100W)

Timeseries of Monthly OLR (Tropical Pacific)



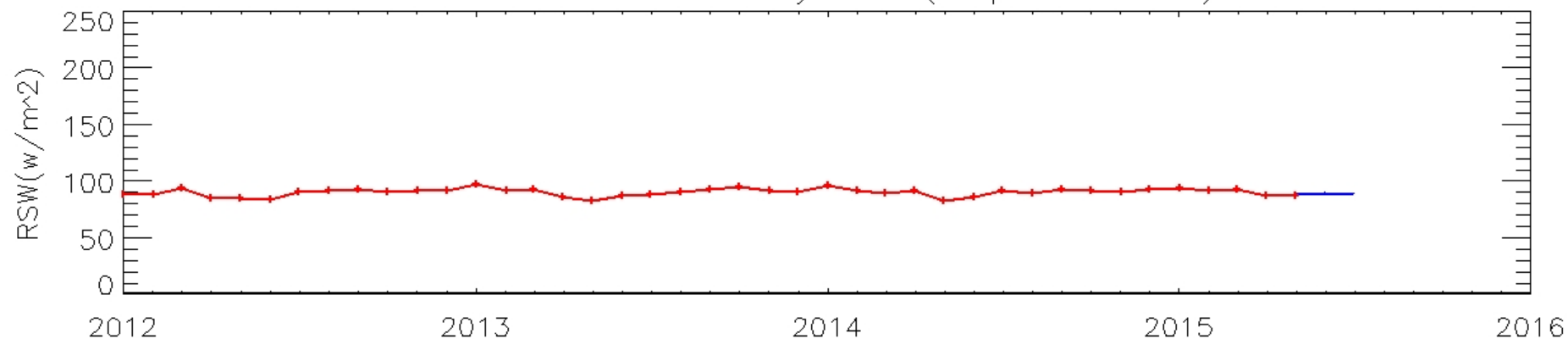
Timeseries of Monthly OLR (Tropical Pacific Anomalies)



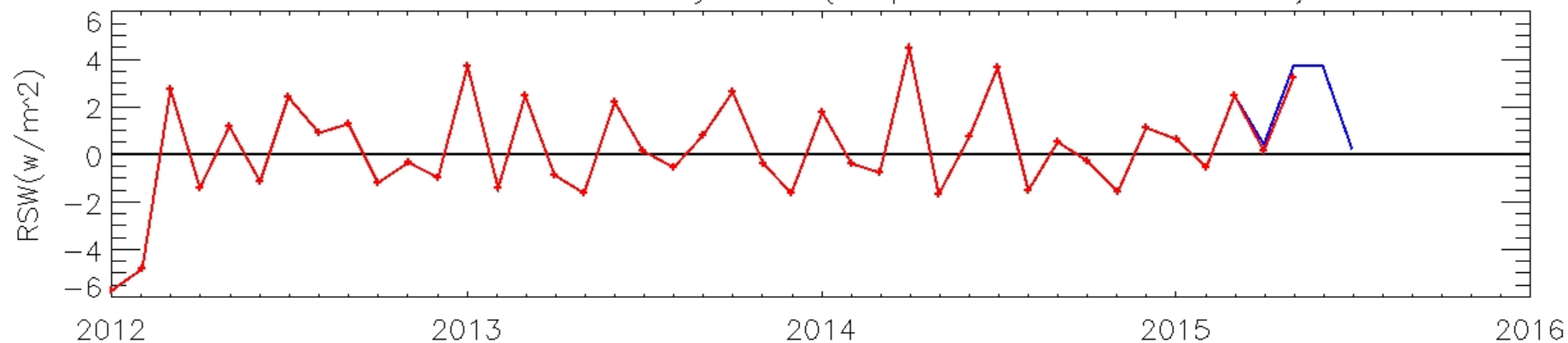


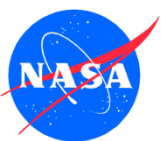
2015 Tropical Pacific Anomalies to Date (20N-20S, 120E-100W)

Timeseries of Monthly RSW (Tropical Pacific)



Timeseries of Monthly RSW (Tropical Pacific Anomalies)





State of Climate 2014: Ocean Fluxes

Yu, Lisan *et al.*,
2015: Ocean
surface and
momentum fluxes
[in "State of the
Climate in 2014"].
BAMS., 96 (7),
S68-S71.

WHOI OAflux
Latent & Sensible
Heat fluxes +
CERES
FLASHFlux year-
to-year difference
for radiative fluxes

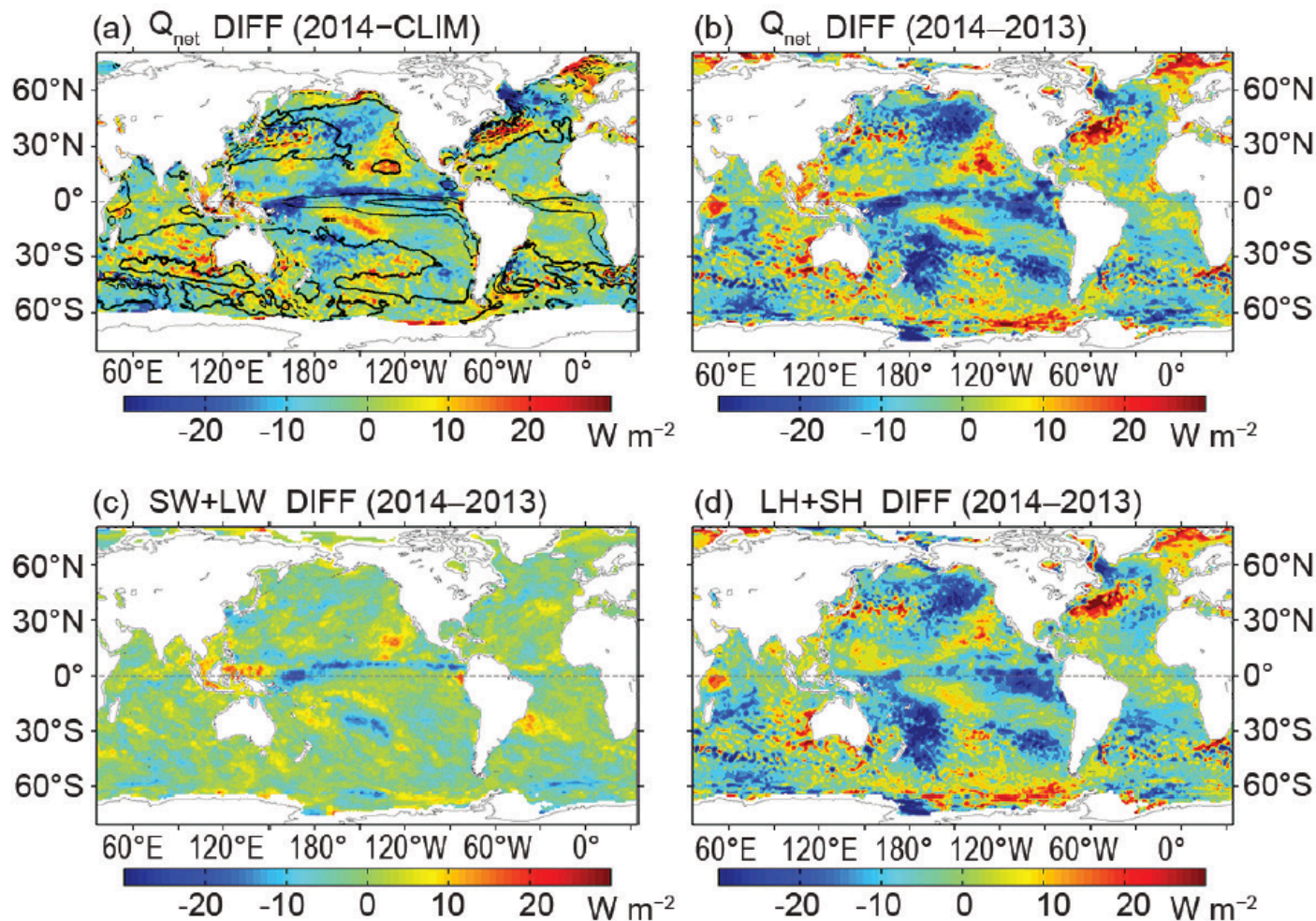
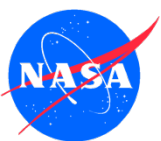


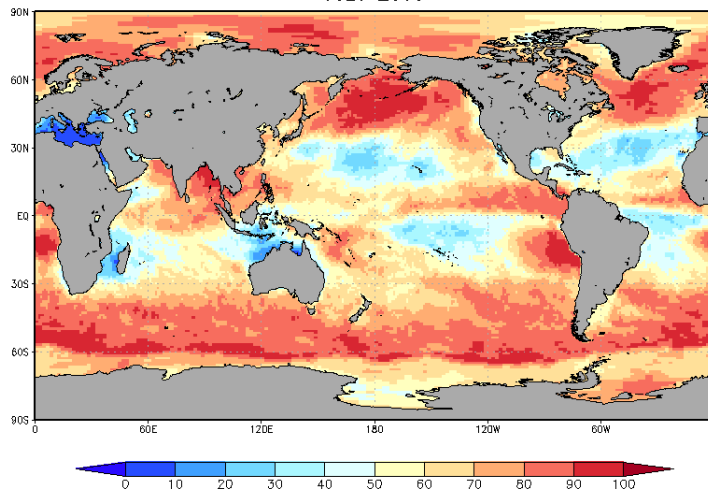
FIG. 3.8. (a) Mean difference in Q_{net} between 2014 and climatology superimposed with Q_{net} mean climatology. Solid black contours denote ocean heat gain, dashed black contours heat loss, and thick black contours $Q_{\text{net}} = 0$. (b) Annual mean difference in Q_{net} between 2014 and 2013. (c) 2014-2013 differences in surface radiation (SW + LW). (d) 2014-2013 differences in turbulent heat fluxes (LH + SH). Positive anomalies denote ocean heat gains in 2014 compared to 2013 and negative anomalies denote heat losses.



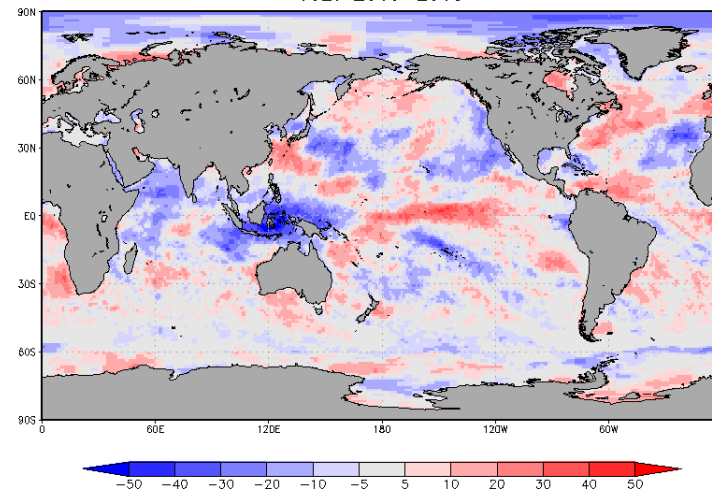
Cloud and Up LW Differences July 2015 - 2013

Cloud

FLASHFlux Cloud Fraction
JULY 2015

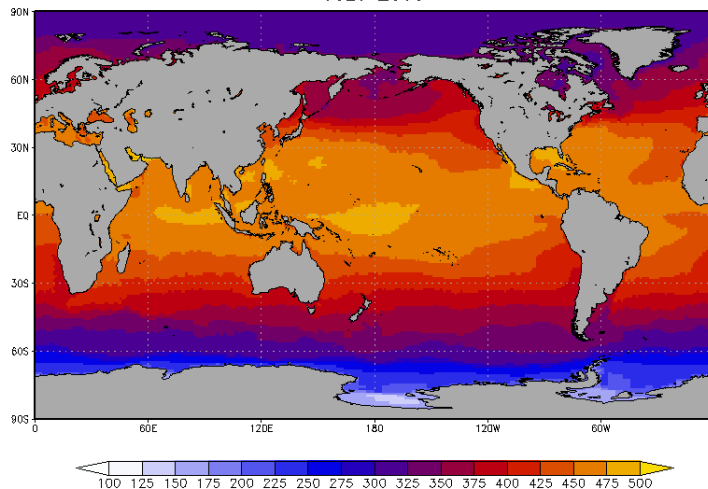


FLASHFlux Cloud Fraction
JULY 2015-2013

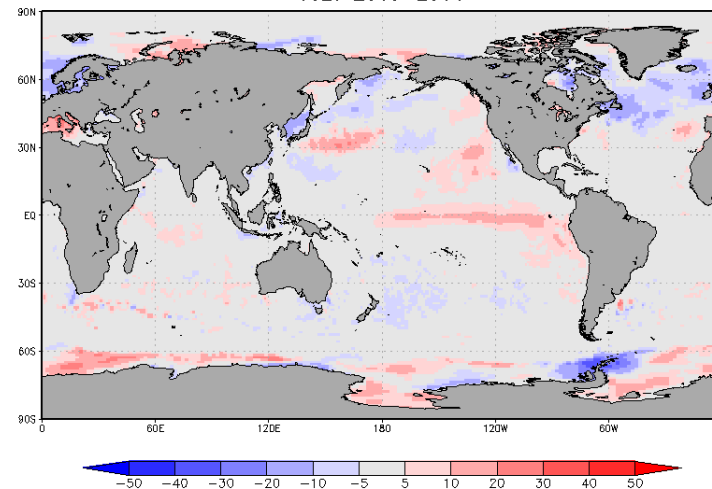


Surface
LW UP

FLASHFlux SFC LW UPWARD
JULY 2015



FLASHFlux SFC LW UPWARD
JULY 2015-2013

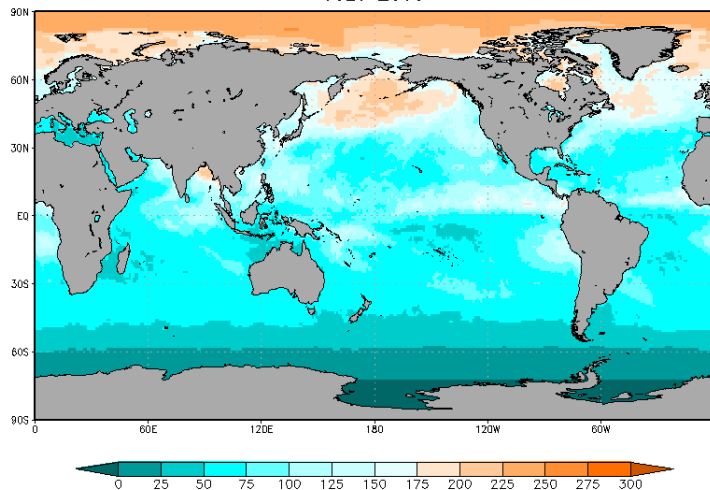




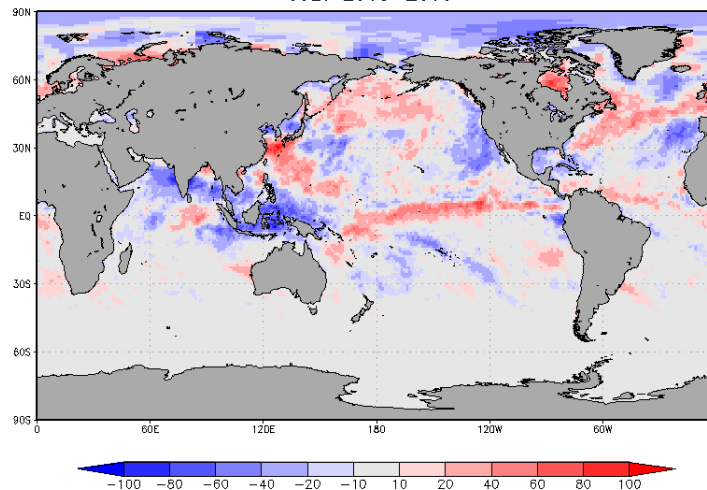
SW Differences July 2015 - 2013

TOA Up

FLASHFlux TOA SW
JULY 2015

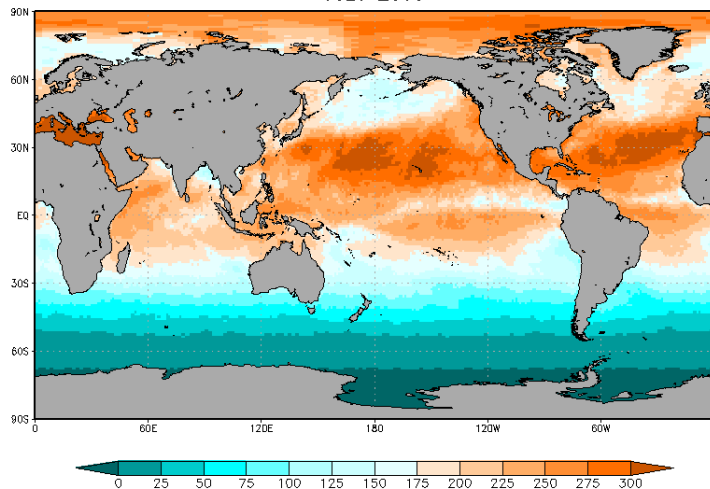


FLASHFlux TOA SW
JULY 2015-2013

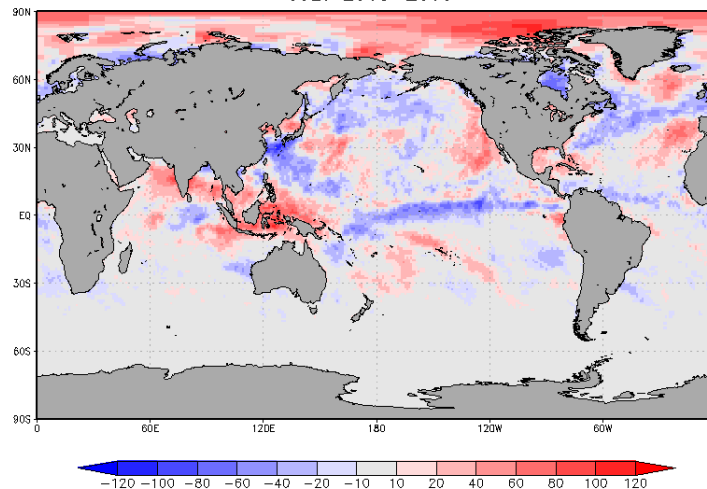


Surface
Down

FLASHFlux SFC SW DOWNWARD
JULY 2015



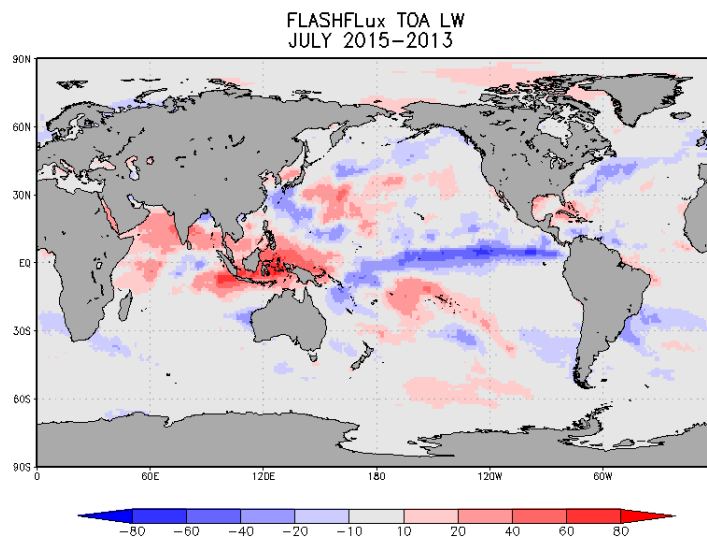
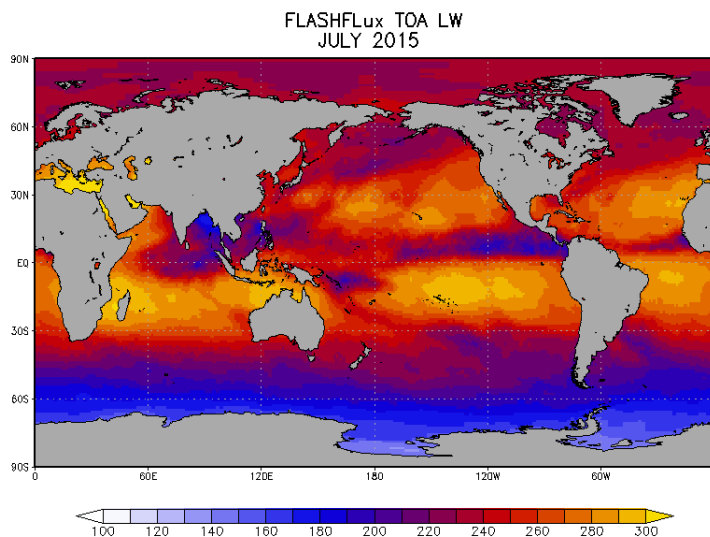
FLASHFlux SFC SW DOWNWARD
JULY 2015-2013



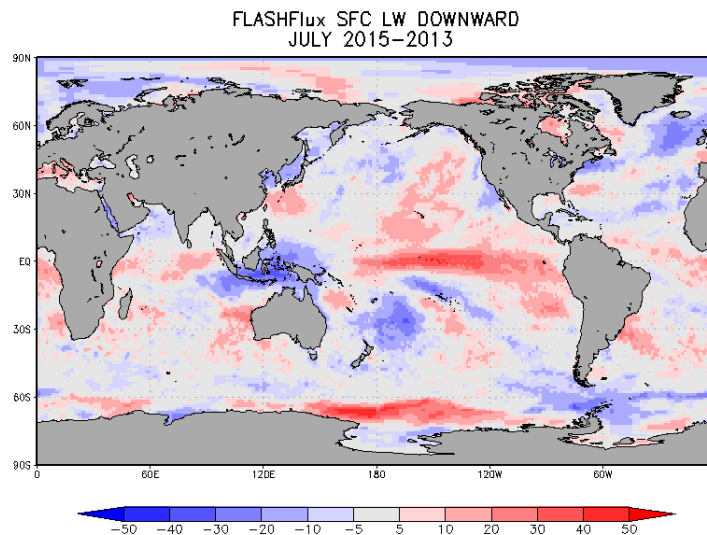
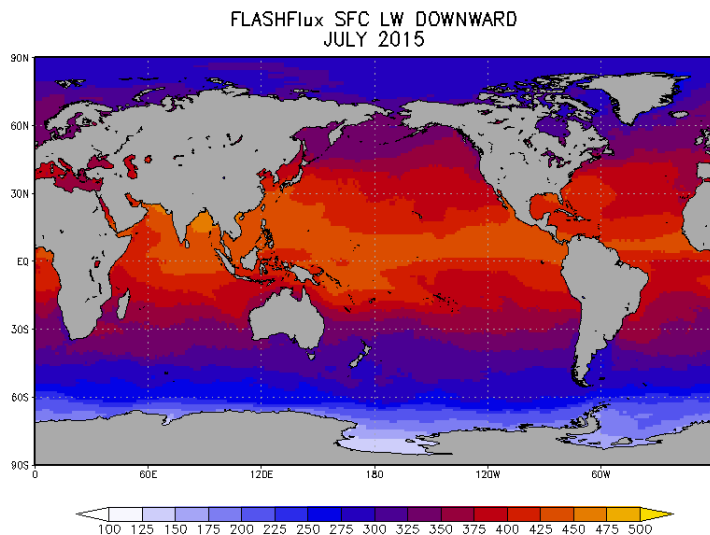


LW Differences July 2015 - 2013

TOA Up



Surface
Down

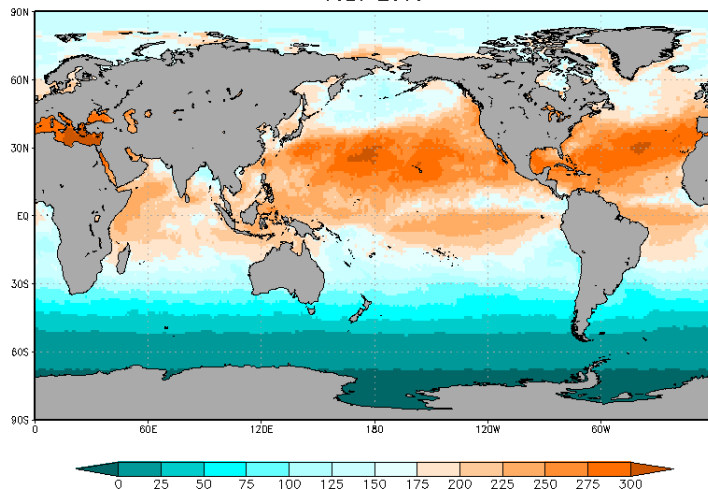




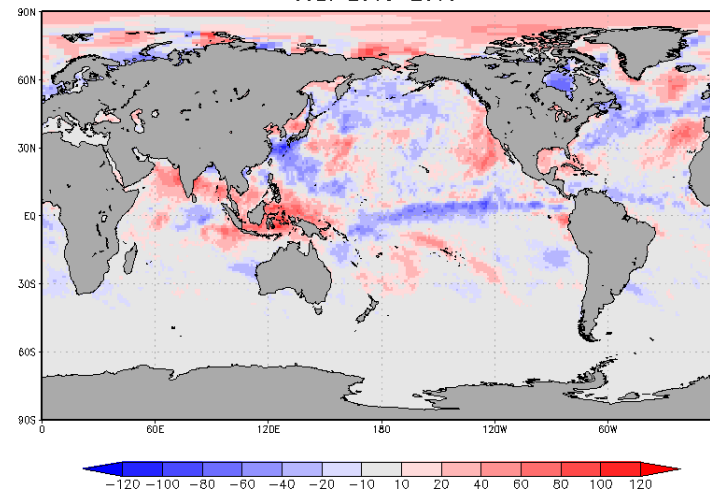
Surface Net Differences July 2015 - 2013

SW
Surface
Net

FLASHFlux SFC SW NET
JULY 2015

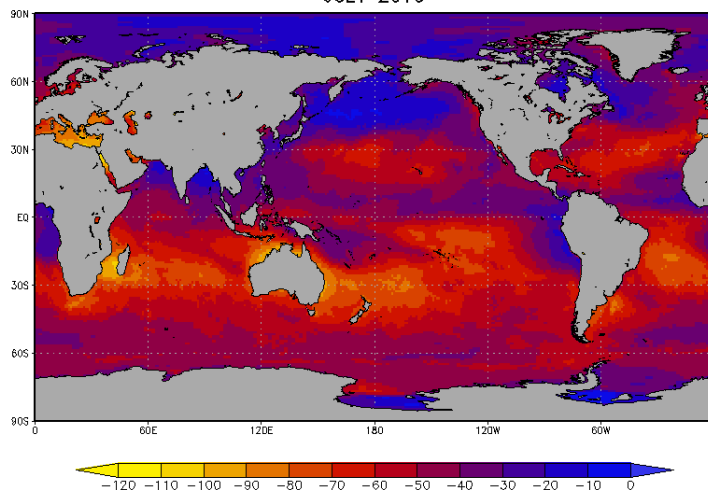


FLASHFlux SFC SW NET
JULY 2015-2013

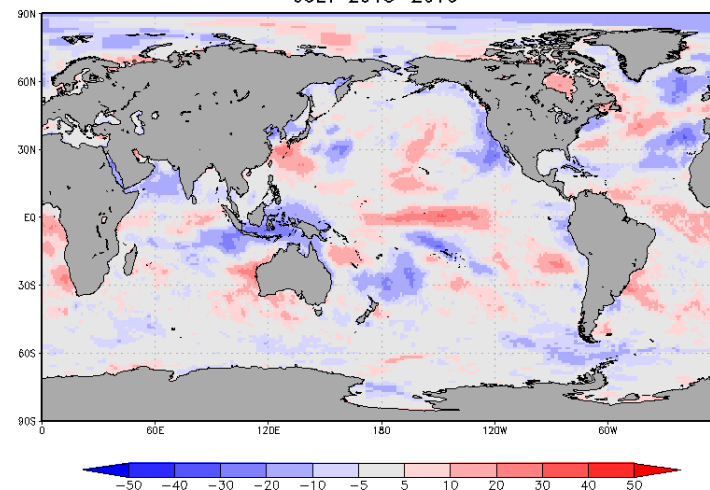


LW
Surface
Net

FLASHFlux SFC LW NET
JULY 2015



FLASHFlux SFC LW NET
JULY 2015-2013

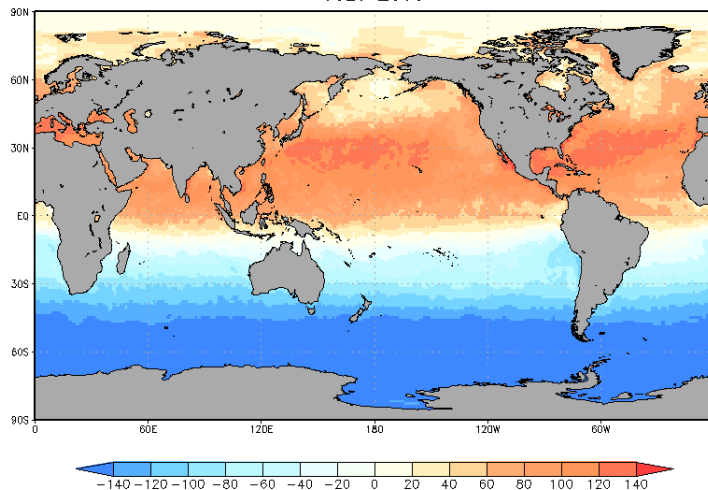




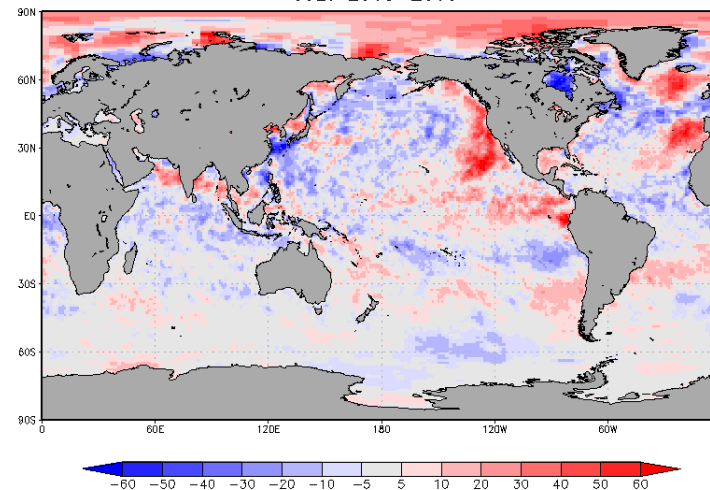
Total Net Differences July 2015 - 2013

TOA

FLASHFlux TOA TOTAL NET
JULY 2015

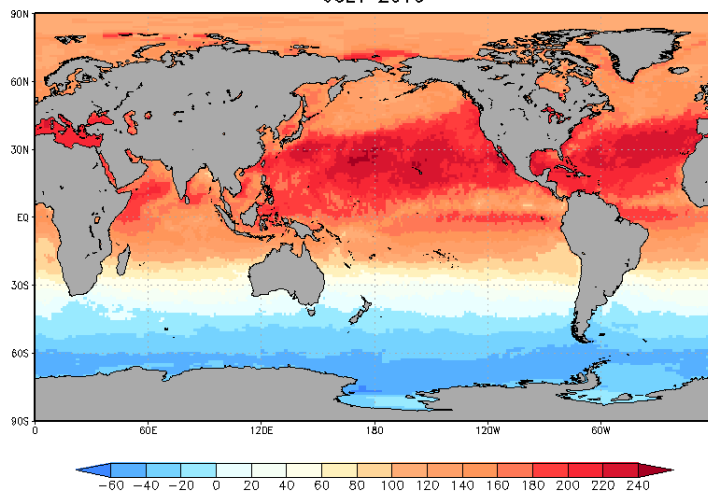


FLASHFlux TOA TOTAL NET
JULY 2015-2013

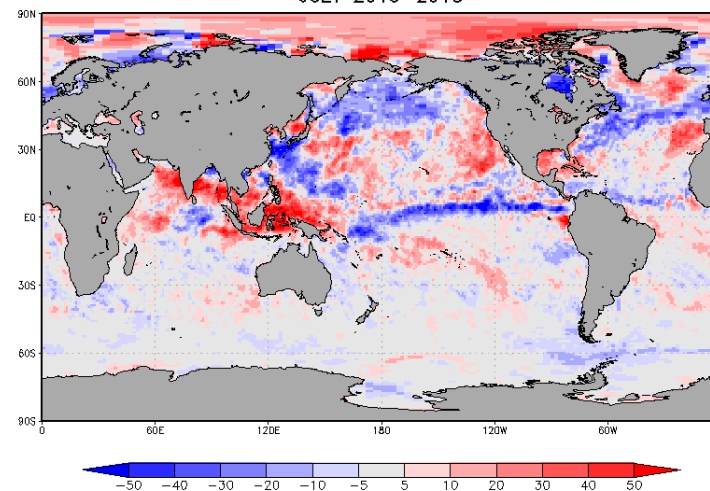


Surface

FLASHFlux SFC NET TOTAL
JULY 2015



FLASHFlux SFC NET TOTAL
JULY 2015-2013



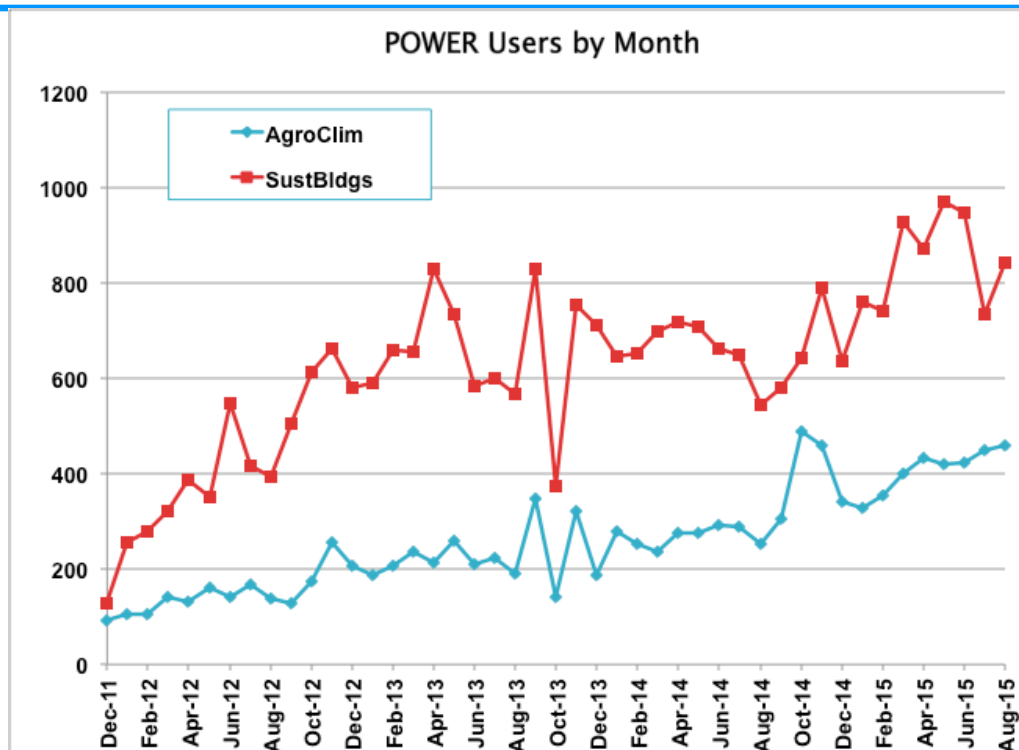


Applied Science Usage

POWER makes ASCII time series data from FLASHFlux and FP-IT available for:

- 1) “Sustainable Building” => energy performance modeling
- 2) “Agroclimatology” => data format according to DSSAT crop modeling format

Average Usage Per Month



Type	Monthly Users	Monthly Orders	Monthly Data Vol (GB)
Sustainable Buildings	788	275,600	5.6
Agroclimatology	405	128,600	15.7
Total	1192	404,200	21.3



Enhancing Applied Science Usage with ArcGIS

ArcGIS Capabilities

- High quality viewing (Desktop/Mobile) and printing
- Data Extraction/Subsetting => Python code to support a variety of data formats from ASCII, to .netCDF, to geoTIF
- Simultaneous Dataset Visualization (Swiping)
- Temporal Visualization (time slider)
- Custom Color Ramps
- Pixel/Attribute Value Identification at Selected Location
- Python code to support computation of on-the-fly parameter computation

Technologies

- Esri ArcGIS Server & Portal
- OPeNDAP
- PostgreSQL & PostGIS

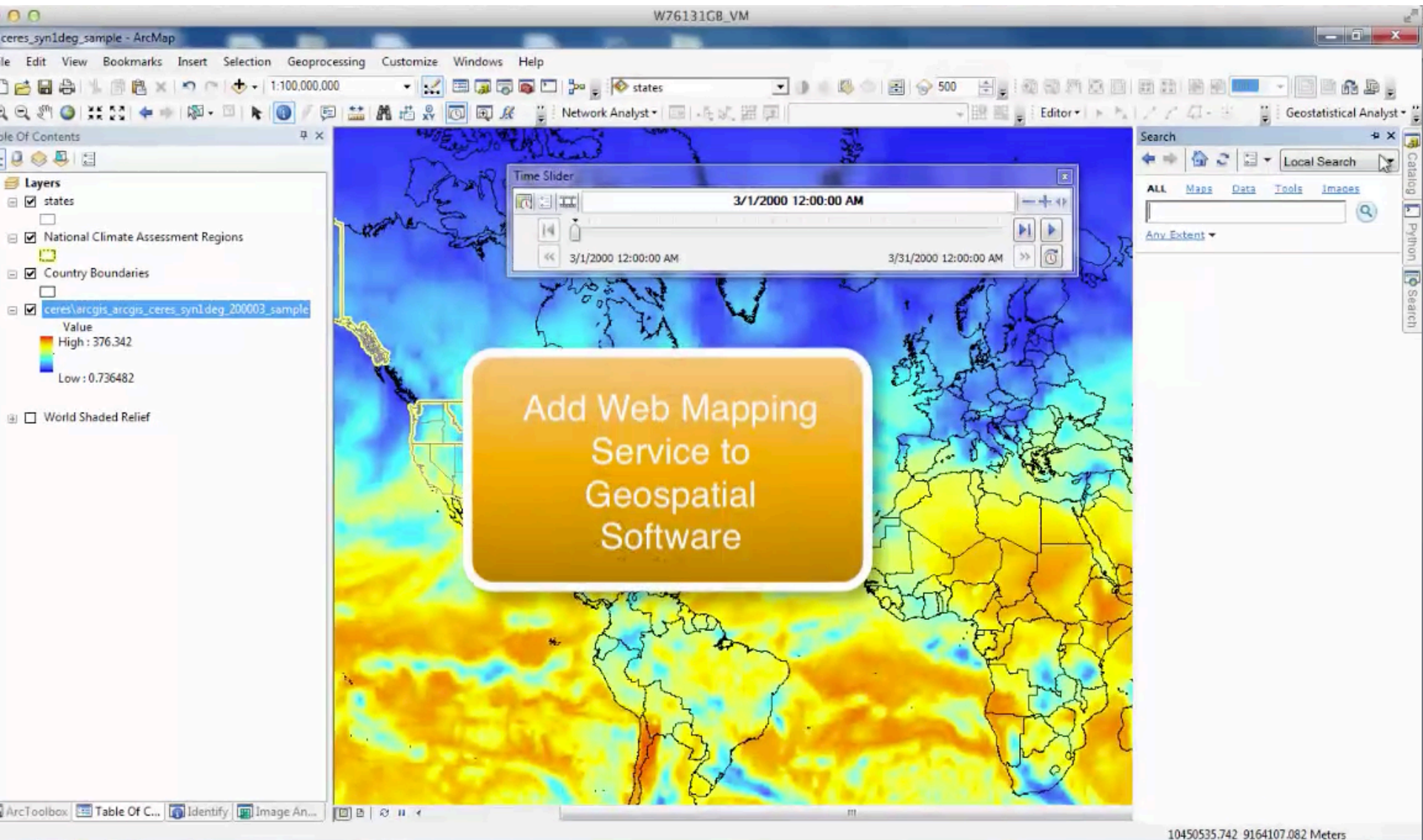
Connectivity

- Climate.gov
- GEOSS (AIP-8)





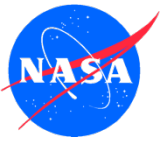
GIS Demonstration





Summary and Conclusions

- ***FLASHFlux 3B***
 - Continuing production and validation for v3B; surface site and ARISE
 - Working to add TISA products to CERES subsetter
 - 2015 El Nino anomalies proving very significant
- ***FLASHFlux Applications:***
 - Continued growth of usage of FLASHFlux through POWER project
 - Developing GIS tools for CERES/POWER and with ASDC
- ***FLASHFlux publications:***
 - 2014 SotC reports published
 - TISA paper next (renewable energy journal?)
- ***Future Versions***
 - Must adapt MOA to accept FP-IT (v2) and evaluate use of aerosol
 - Will coordinate with Clouds and Inversion teams to adapt to Ed 4
 - Begin work on NPP SSF production system as new modules arrive



FLASHFlux Web Sites:

<http://flashflux.larc.nasa.gov>